Historical and Current Assemblages of the Youghiogheny River Watershed: Implications for Determining Reference Conditions and Conducting Stream Restoration

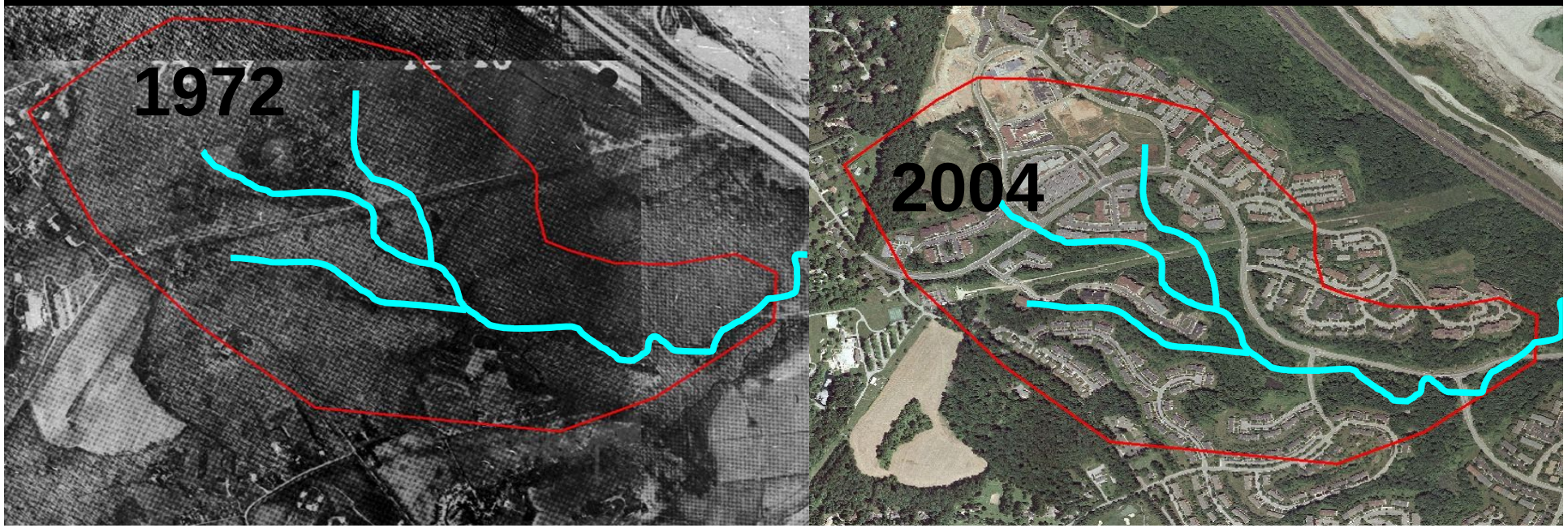
Shifting Baseline Syndrome

“Each generation of fisheries scientists accepts as a baseline [the condition]... that occurred at the beginning of their careers and uses this baseline to evaluate changes …. The result is a gradual shift of the baseline, a gradual accommodation of the creeping disappearance of resource species and inappropriate reference points for evaluating … losses …or for identifying targets for rehabilitation.”

Daniel Pauly 1995. Anecdotes and the shifting baseline syndrome of fisheries. TREE 10: 430.

Problem

Shifted baselines substantially influence reference condition determination



Concepts often applied to defining reference

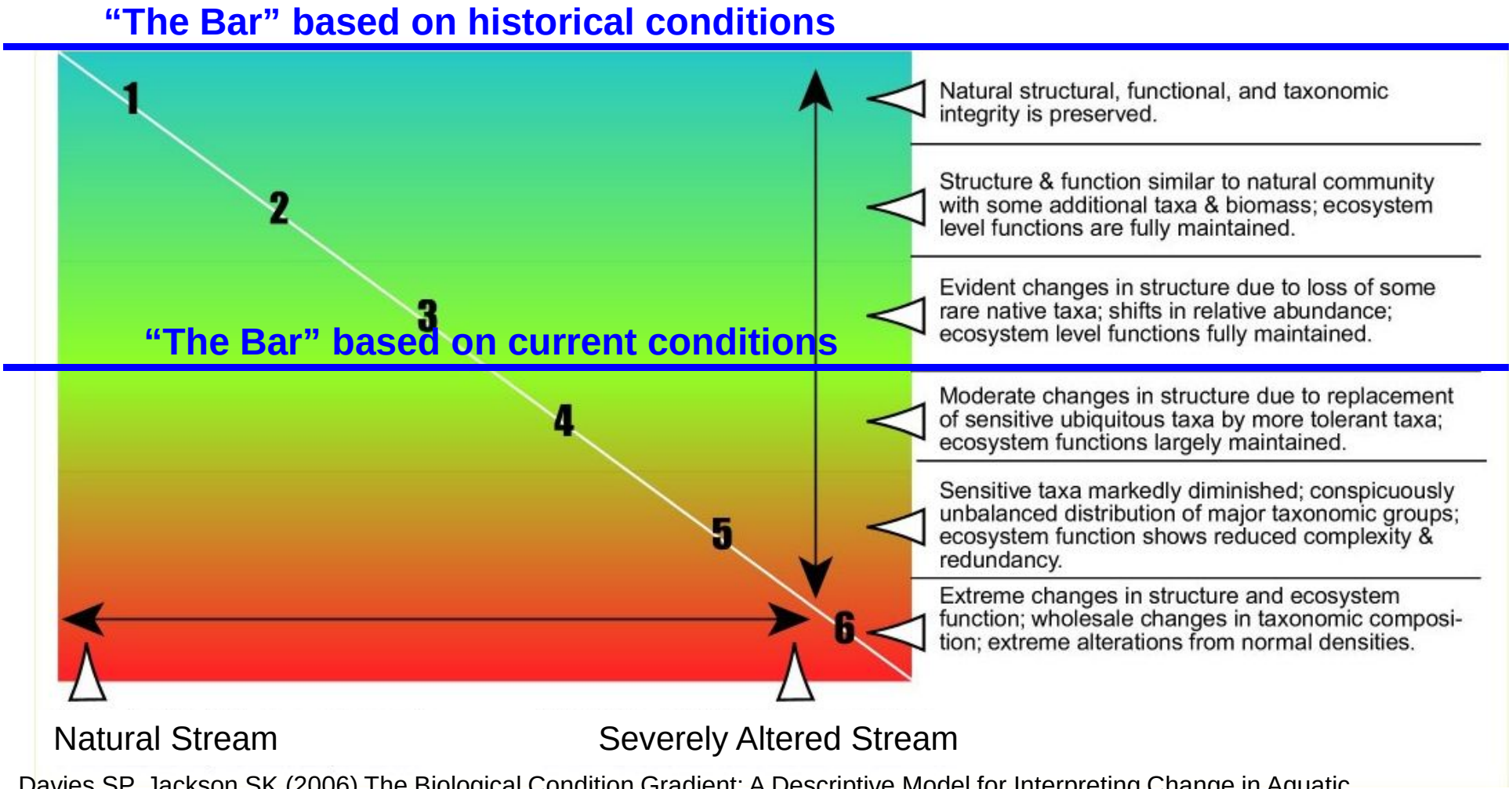
- Best attainable
- Best available
- Least impaired/degraded
- Minimally impacted

www.epa.gov/bioiweb1/html/criteria_for_reference_sites.html

Even with stringent reference criteria, current conditions likely don't represent historical conditions (Harding et al. 1998)

Harding, J.S., E.F. Benfi eld, P.V. Bolstad, G.S. Helfman, and E.B.D. Jones III. 1998. Stream biodiversity: The ghost of land use past. Proceedings of the National Academy of Sciences USA 95:14843–14847.

The Biological Condition Gradient Concept Provides a Framework For Incorporating an Understanding of Legacy Impacts Into an Assessment of Ecological Condition



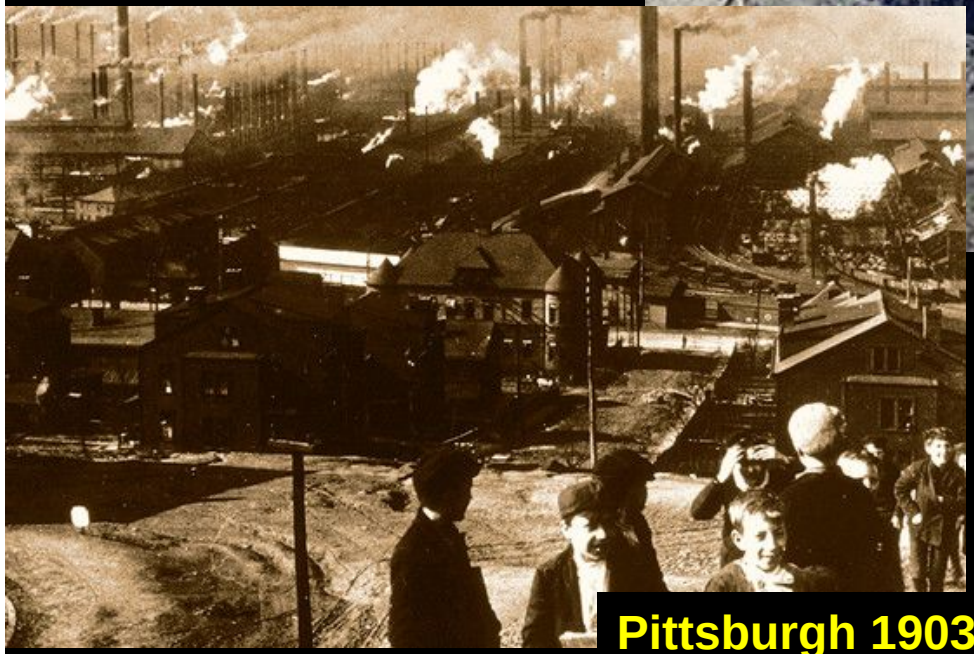
Davies SP, Jackson SK (2006) The Biological Condition Gradient: A Descriptive Model for Interpreting Change in Aquatic Ecosystems. Ecological Applications: Vol. 16, No. 4 pp. 1251–1266

Historical Conditions - The Youghiogheny River before 1909

More than 100 fish species may have lived in Yough watershed.

1834 – 1865 the Youghiogheny River in MD was known for having abundant and large brook trout (up to 22 inches and 5lbs) and smallmouth bass

Industry and Mining in the Early 1900's



Pittsburgh 1903

Acid Mine Drainage

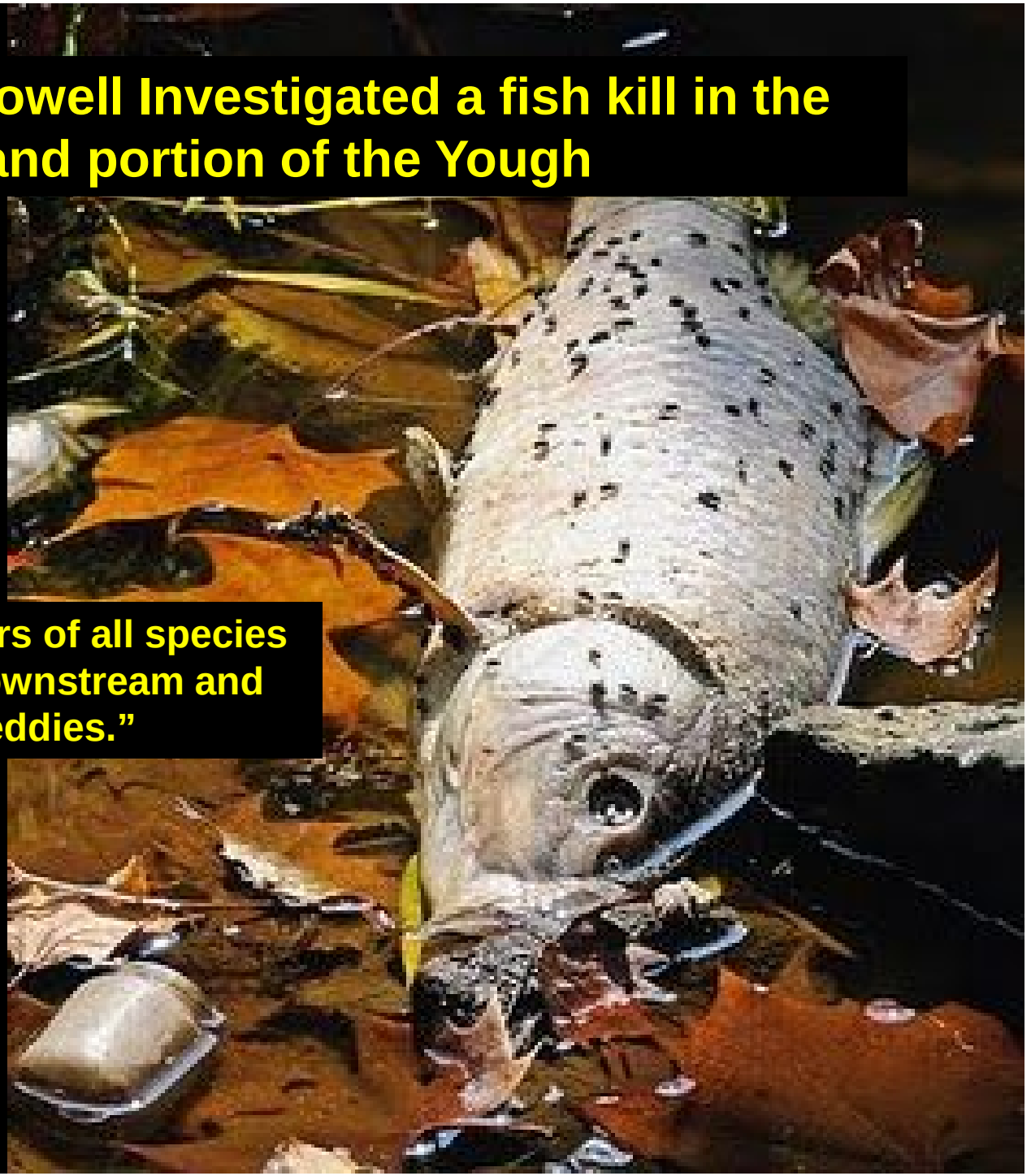
“We may say that of the Monongahela drainage by far the greatest part is utterly polluted, chiefly by mine water.”

“in many cases …..life had entirely disappeared from many streams”

Ortmann 1909

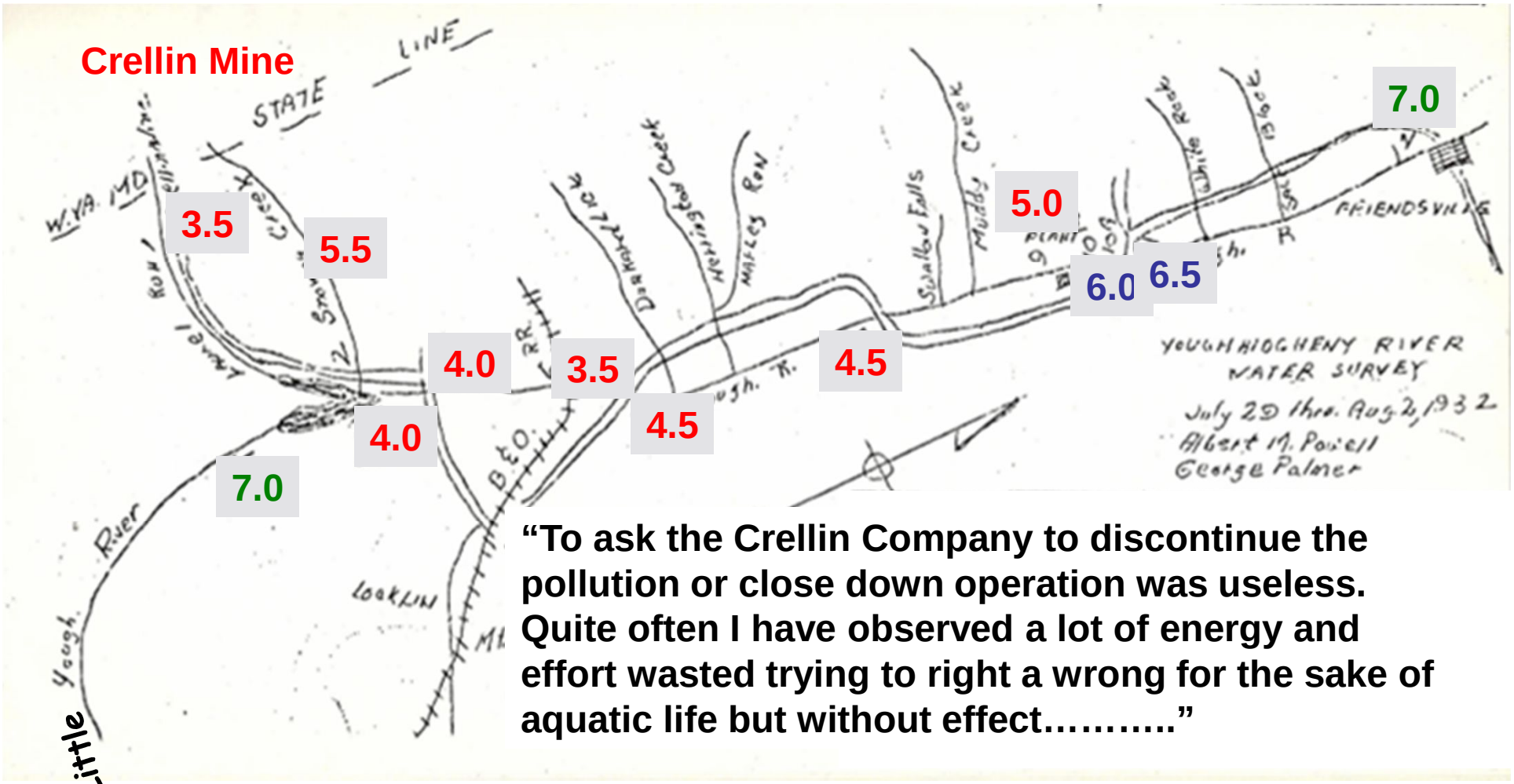
The Youghiogheny above Confluence, south into Maryland, is very clear and pure.”

In 1929 Albert Powell Investigated a fish kill in the Maryland portion of the Yough



"…..many numbers of all species of fish floating downstream and collecting in the eddies."

pH readings from the Youghiogheny River in 1929



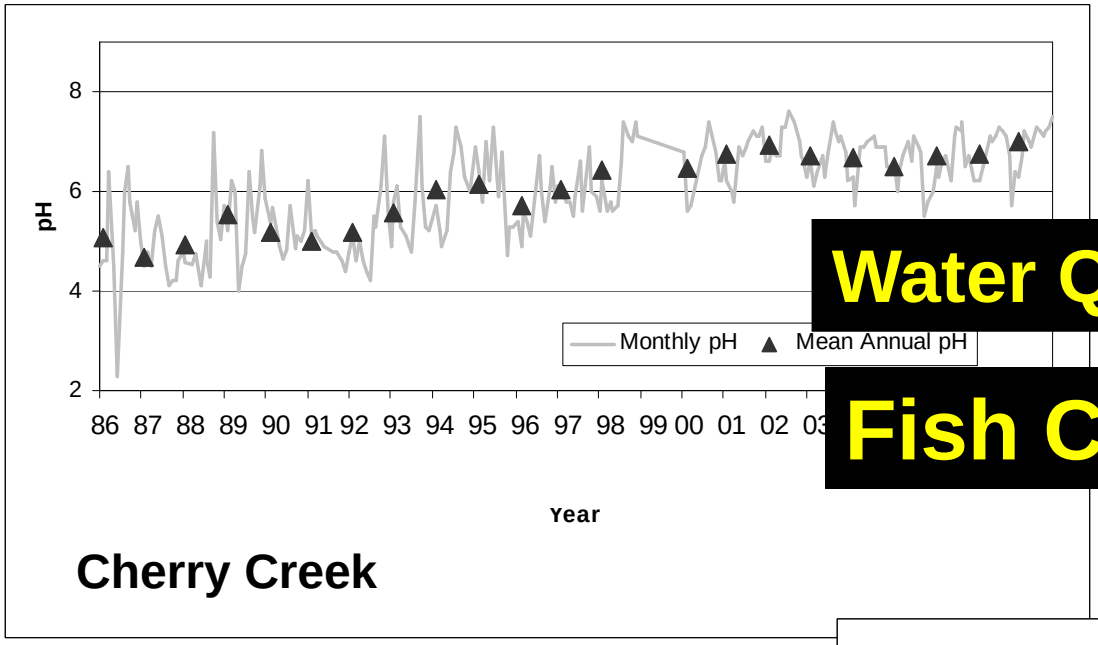
“To ask the Crellin Company to discontinue the pollution or close down operation was useless. Quite often I have observed a lot of energy and effort wasted trying to right a wrong for the sake of aquatic life but without effect……..”

“As late as 1950 the Youghiogheny is known to have been polluted as far down river as Friendsville and considered practically lifeless.”

“This and other recent studies have uncovered just 18 species of fish in the main river and tributaries”

Reppert 1964

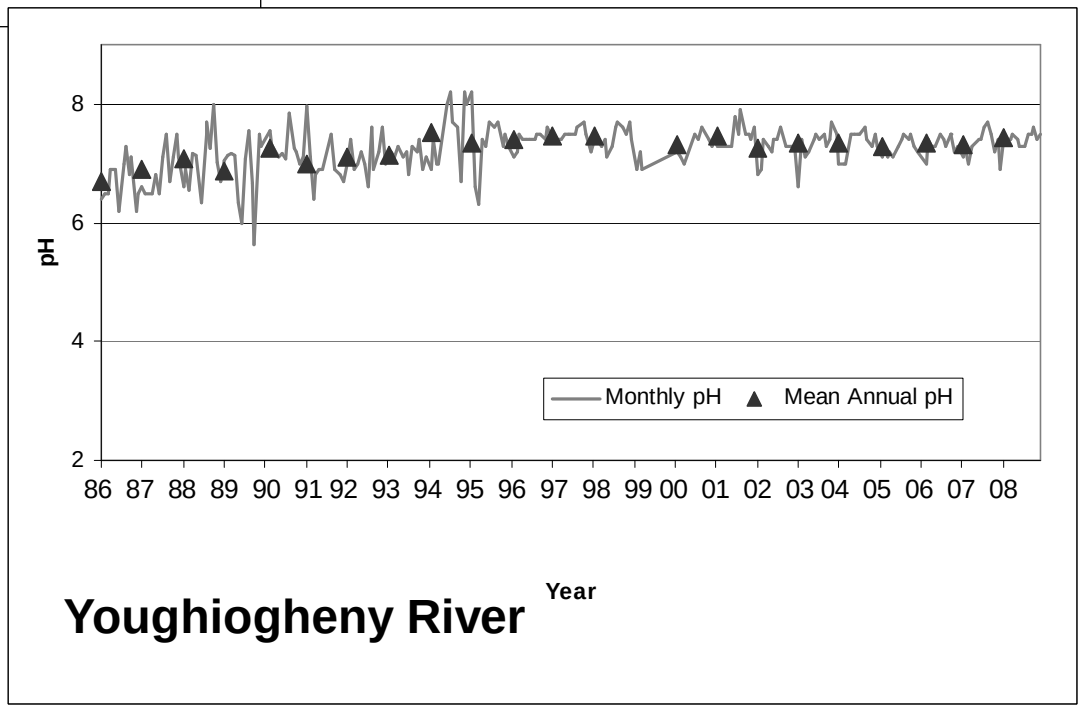
1960s and 70's - Mining Ended - Lime Dosing Began



Cherry Creek

Water Quality Has Improved

Fish Can Return, Right?



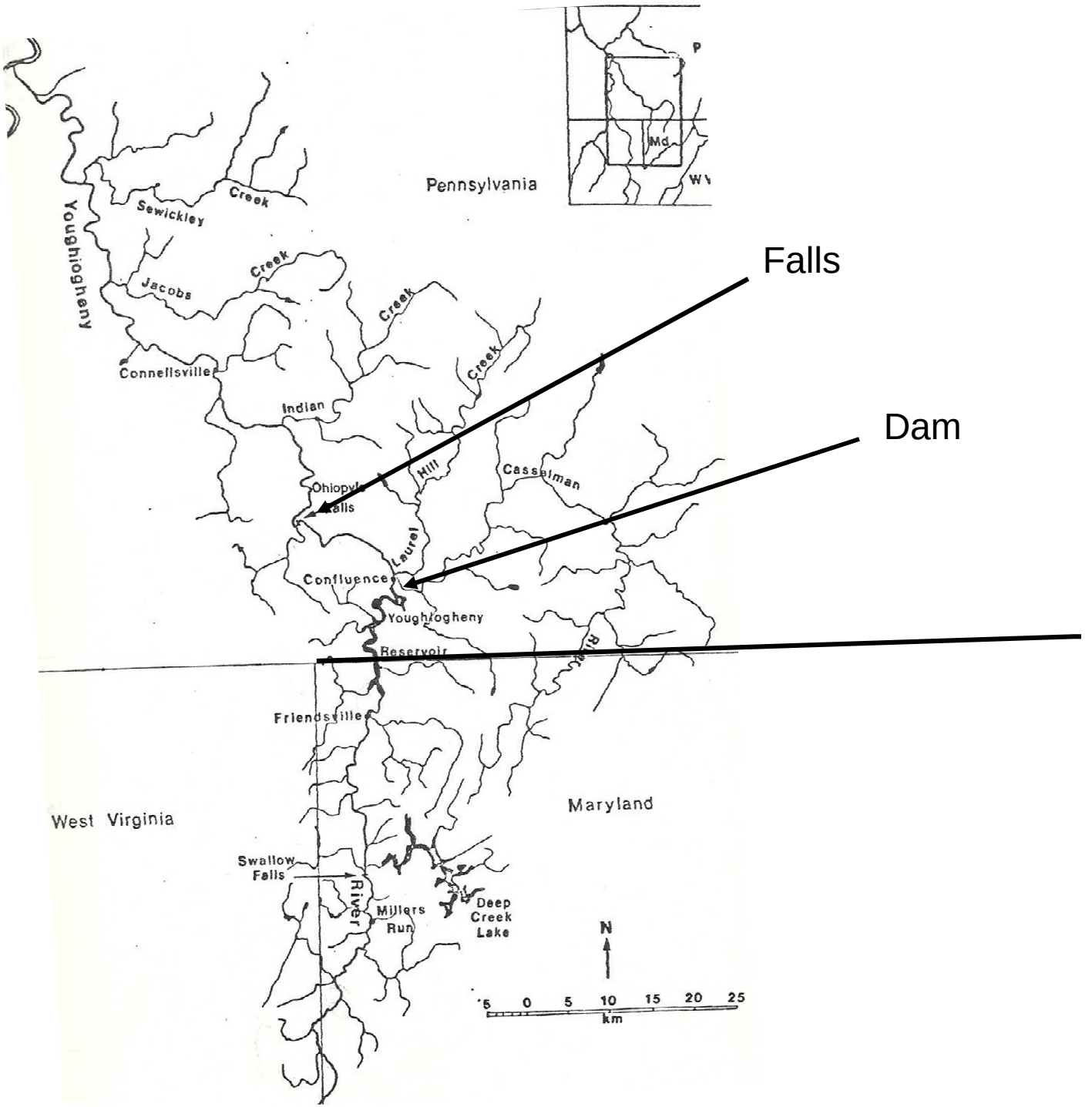
Youghiogheny River

“a…cause of destruction of life … not connected with the deterioration of the quality of the water…..the *damming of certain rivers* prevent the free migration…of fishes…an obstacle to the natural restocking of the rivers…”

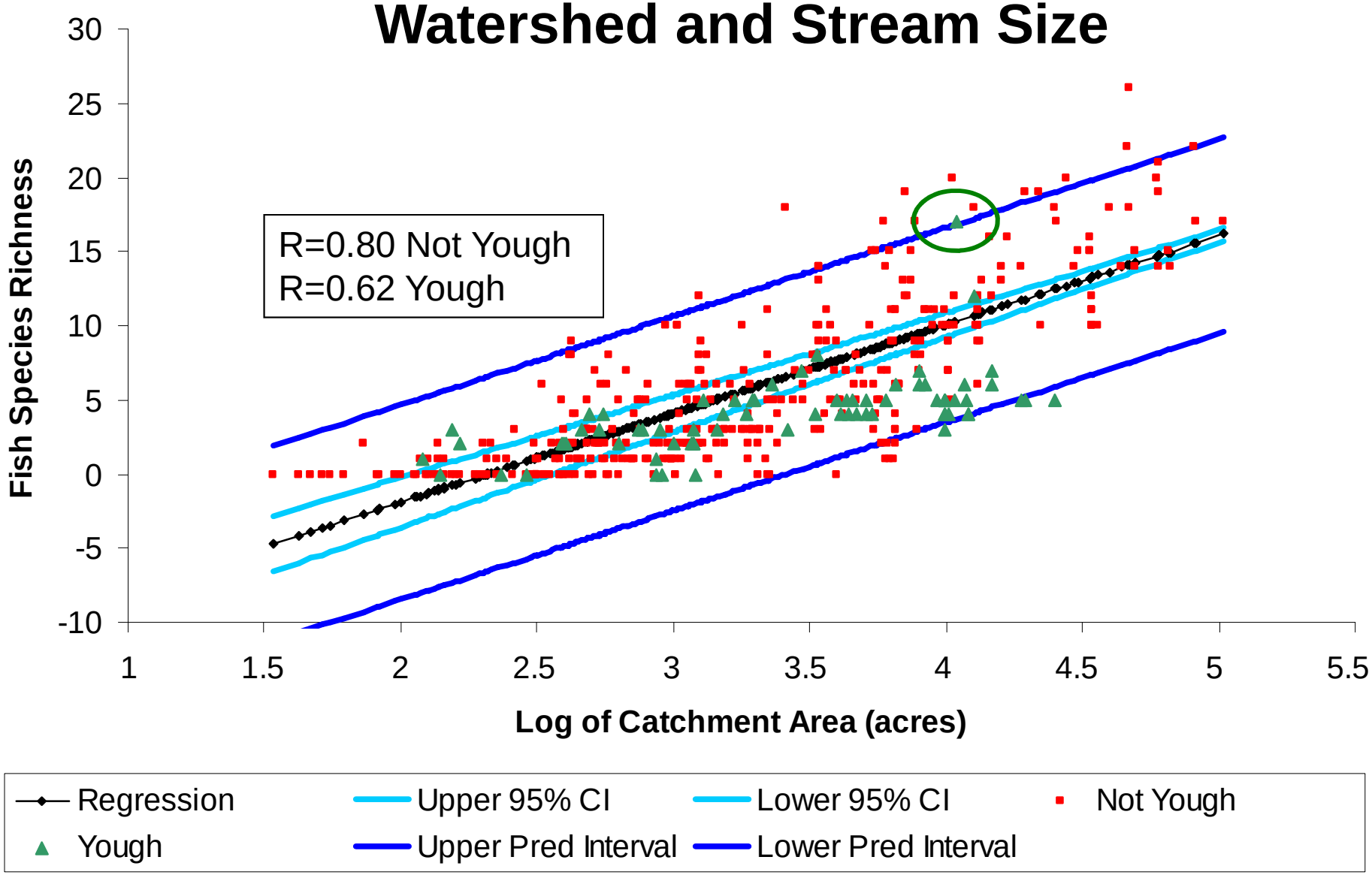
Ortmann 1909

Yough dam built 1944

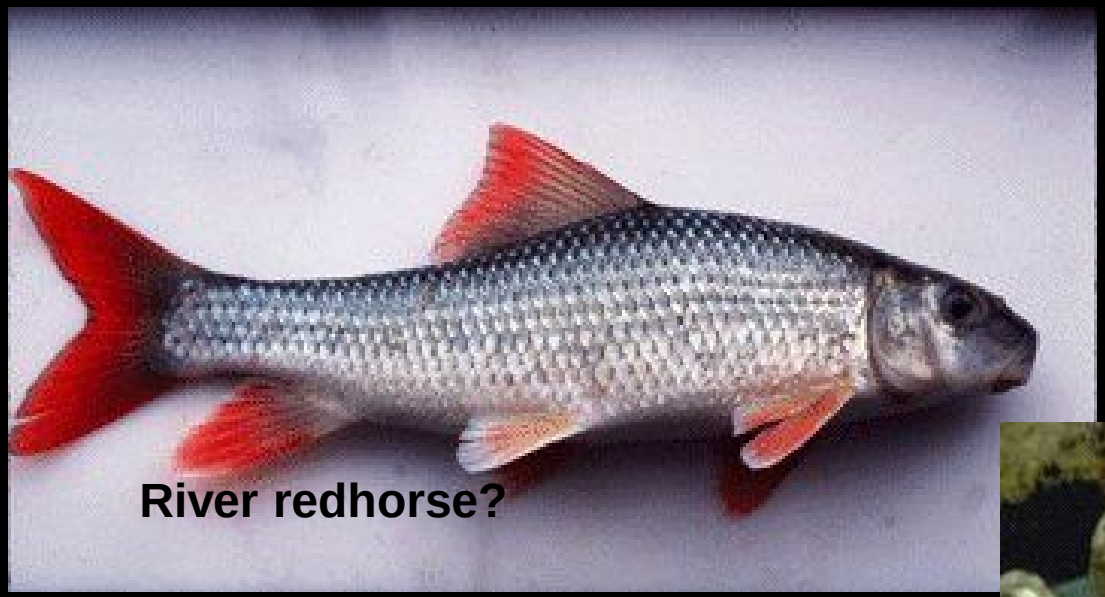
Falls at Ohiopyle


Pennsylvania
Md.
Youghiogheny
Sewickley
Creek
Jacobs
Creek
Creek
Creek
Connellsville
Indian
Hill
Casselman
Ohiopyle
Falls
Laurel
Confluence
Youghiogheny
Reservoir
River
Friendsville
West Virginia
Maryland
Swallow
Falls
River
Miller's
Run
Deep
Creek
Lake
N
5 0 5 10 15 20 25
km
Falls
Dam

Fish Species In Maryland Portion of the Yough Watershed and Stream Size



What Fish Should Be in the Maryland Portion of the Youghiogheny River that Aren't?



River redhorse?

Stonecat?

Late 1970s Research Revealed Nine Species Probably Extirpated Entirely (**Hendricks 1980)**

Highfin carpsucker

Streamline chub

Goldeye

Brook silverside

Silver redhorse

River redhorse

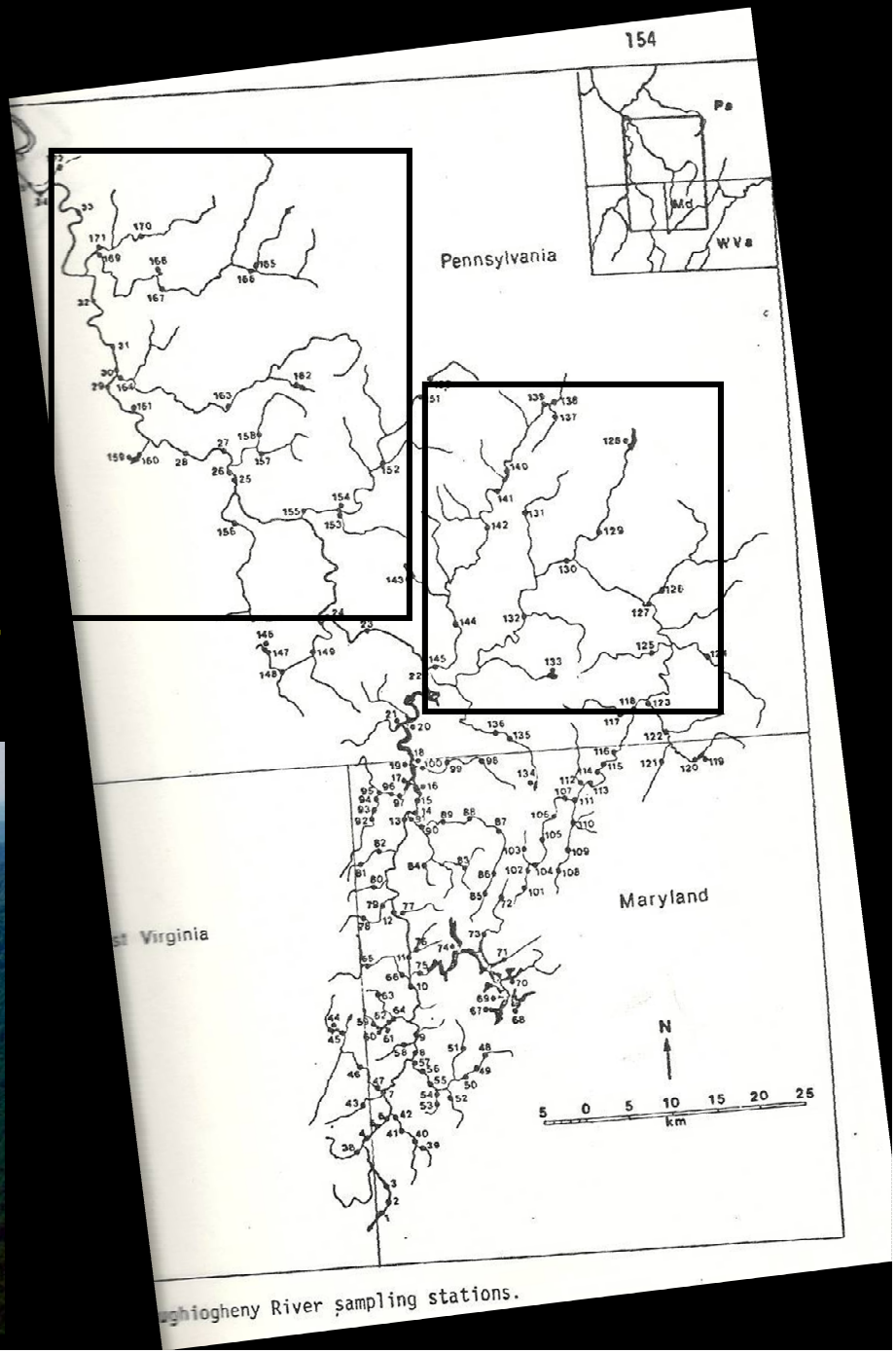
Shorthead redhorse

Longhead darter

Hendricks (1980) Also Found:

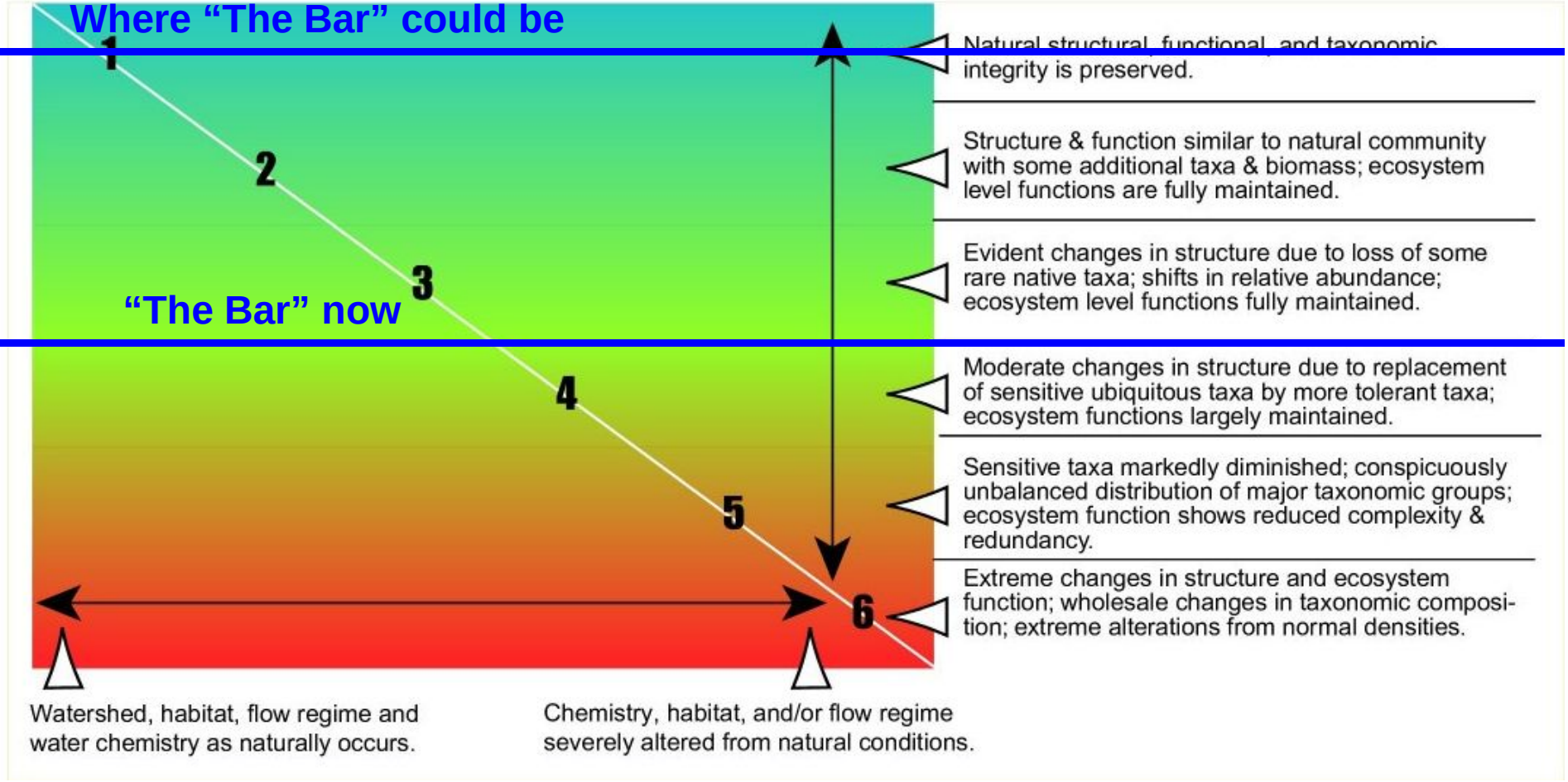
21 Species In Yough, But Not Maryland

- **13 species Downstream of Ohiopyle Falls – Not Above**
- **9 Species Above Ohiopyle, Not Above the Yough Dam**



Implications for Determining Reference Conditions

By Using Existing Ecological Conditions of Streams Like The Youghiogheny as "Reference" We Are Substantially Lowering Our Standards



Implications for Restoration

Restoring The Ecological Conditions of Streams, Like the Yough, With Improved Water Quality May Be Substantially Easier Than Restoring Highly Impacted Streams

Let’s see how close we can get to the historical condition!

“It is generally known that the advance of civilization in a country is connected with the retreat and disappearance of the indigenous fauna”
-Arnold Ortmann 1909

Only the Nerdy Biologists Care About Losing Stream Species

“Don’t it always seem to go that you don’t know what you’ve got ‘till it’s gone”

Joni Mitchell 1970

The Biological Condition Gradient Concept Provides a Justification for Improving Relatively "Good" Streams - Raising our Standards ("The Bar")